

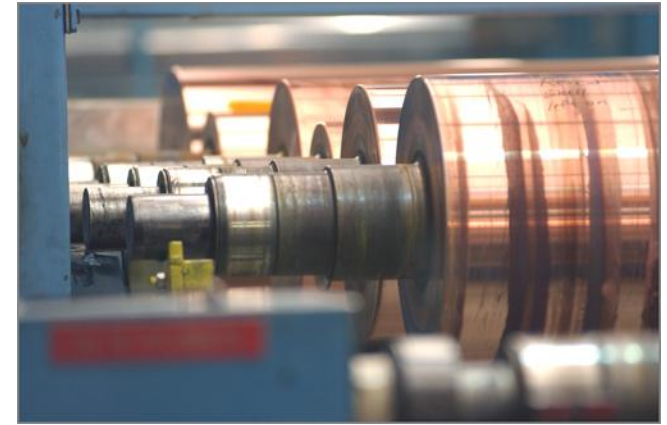
Gravure Imaging



Gravure Publishing Council Conference
Naples, Florida November 17-19, 2010

Copper Cylinders

- Copper is used to cover cylinders because it's soft and pliable, making it easy to engrave.
- Each cylinder weighs approximately 2,500 pounds – about the same weight as a VW Beetle.
- Cylinders last for tens of millions of impressions, so the gravure process is conducive to very long press runs.



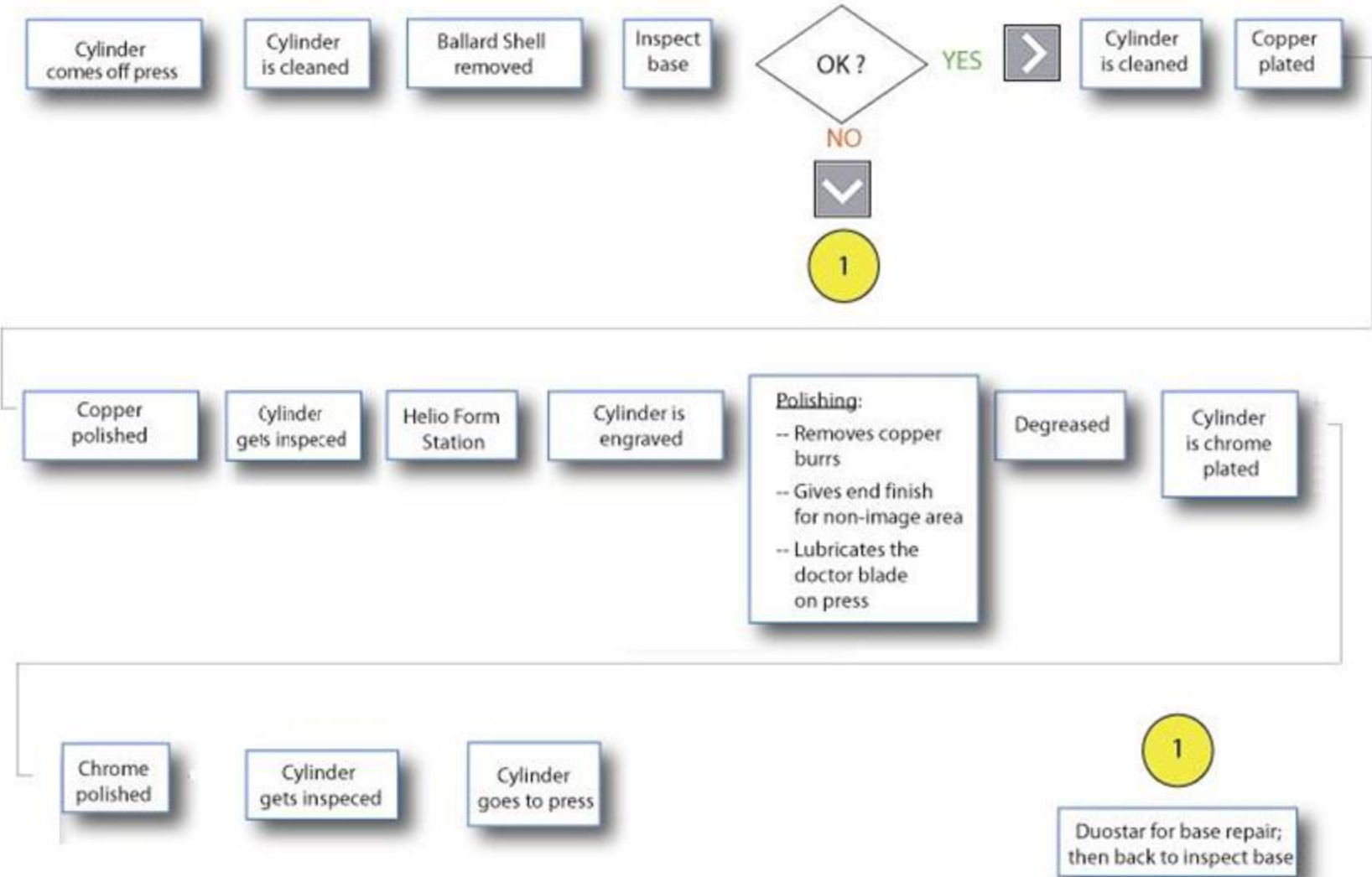
The gravure image carrier is a re-usable steel-based cylinder covered with a layer of copper



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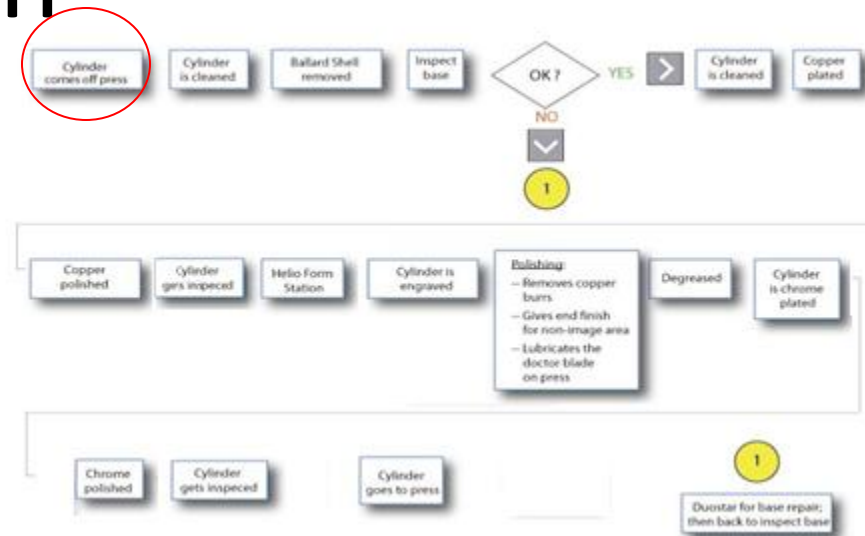


Gravure Workflow



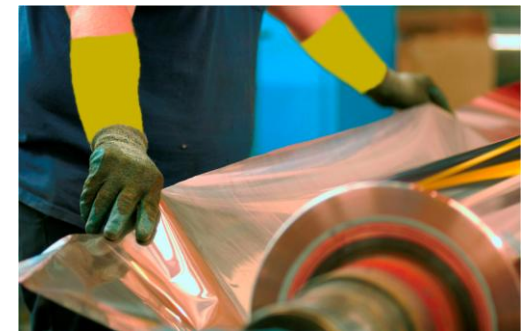
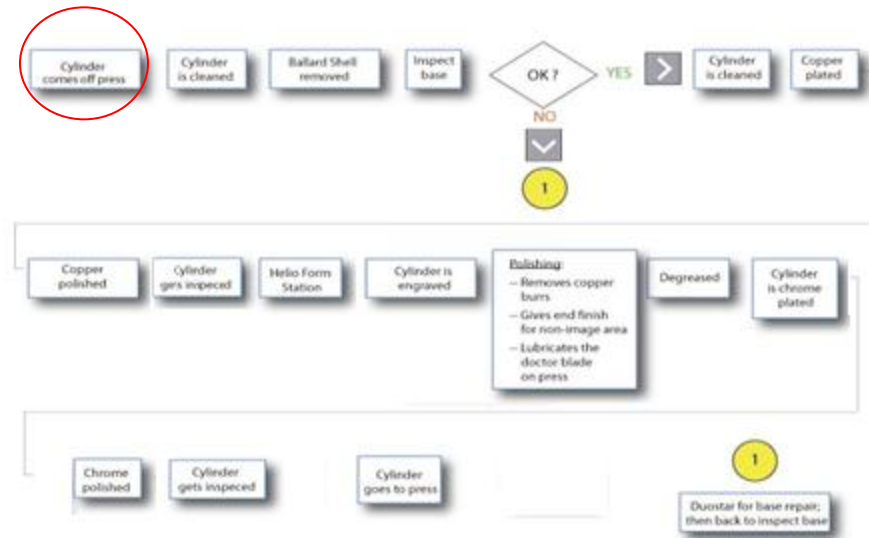
Cylinder Preparation

- The gravure imaging process begins with the cylinder coming off the press.
- Gravure cylinders come in various circumferences.
- The cylinder size is determined by the final size of the page, the number of pages in the form and the repeat of the design, if any.



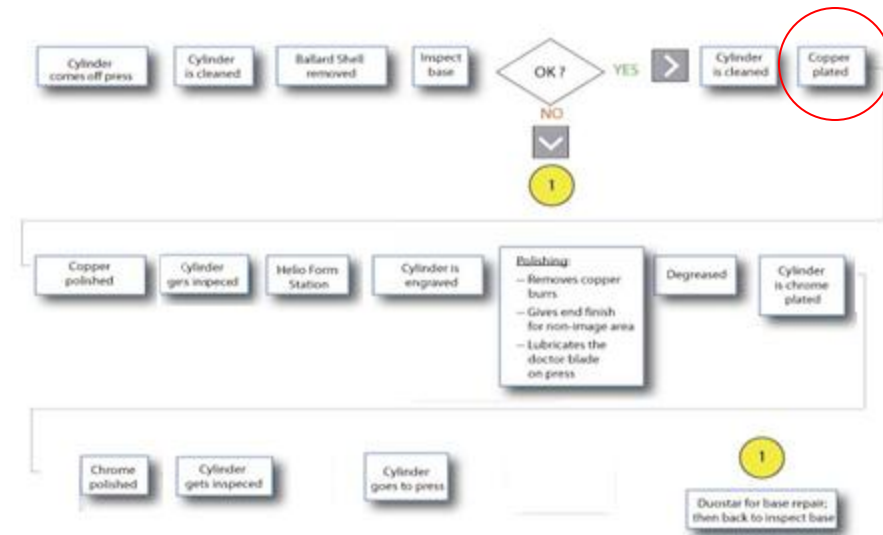
Stripping Station – Removing Ballard Shell

- After the cylinder is cleaned, the top layer of copper and chrome is removed from the cylinder.
- This is called the Ballard shell, which allows the cylinder to be reused many times.



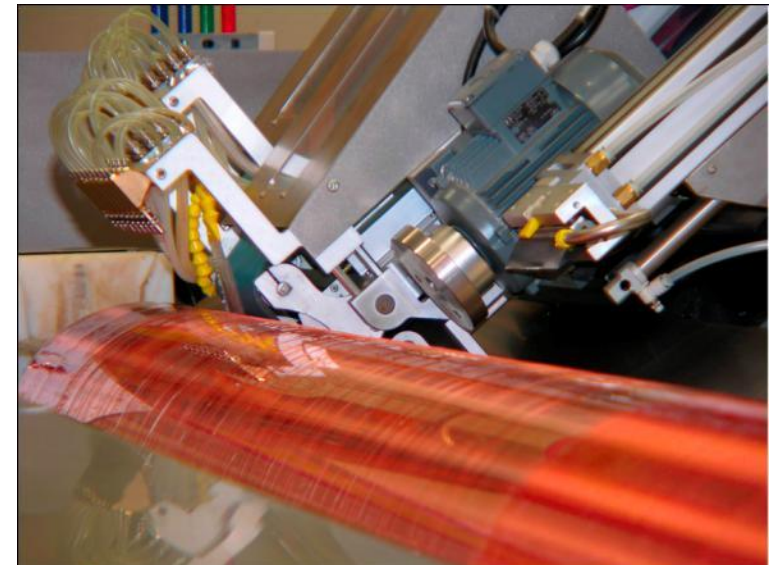
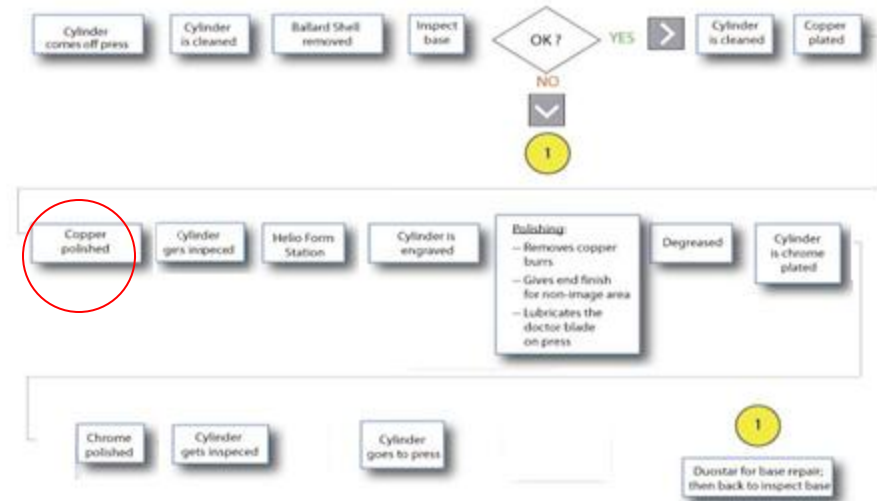
Copper Plating

- After the cylinder is cleaned, it's moved to a copper plating tank, where the steel cylinder is electroplated with a thin layer of copper.
- The cylinder is stored in racks to use for future jobs.
 - Lomira stores up to 2,000 cylinders
- The copper is only 80 microns thick – about the thickness of a human hair.
- Later, the copper will be removed from the cylinder and replaced, so the cylinder can be used over and over.



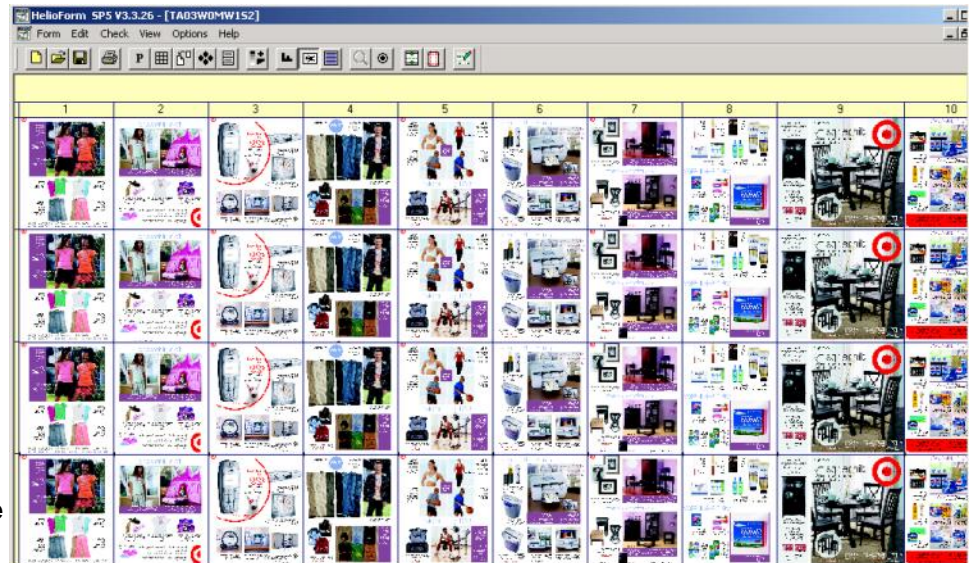
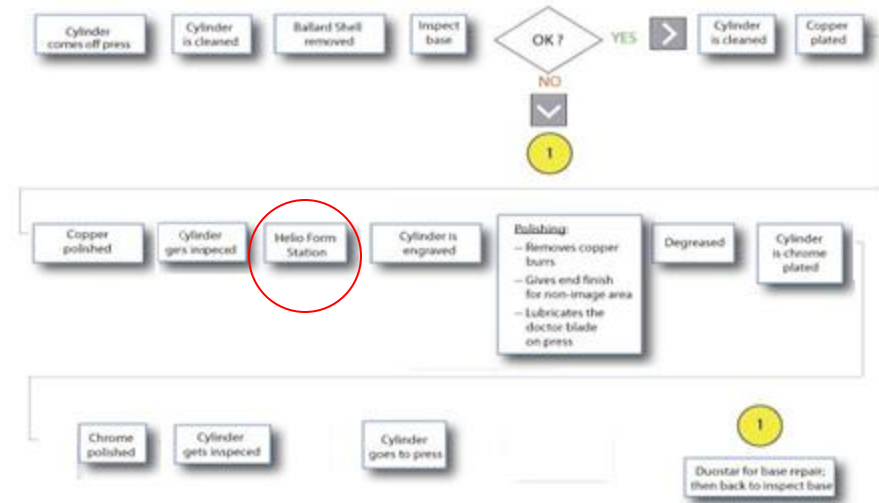
Copper Polish

- To prepare for engraving, the copper surface is automatically polished.
- Polishing removes any imperfections and smooths out the cylinder.
- Polishing also adds a roughness to the surface so it can retain the ink that will lubricate the cylinder.



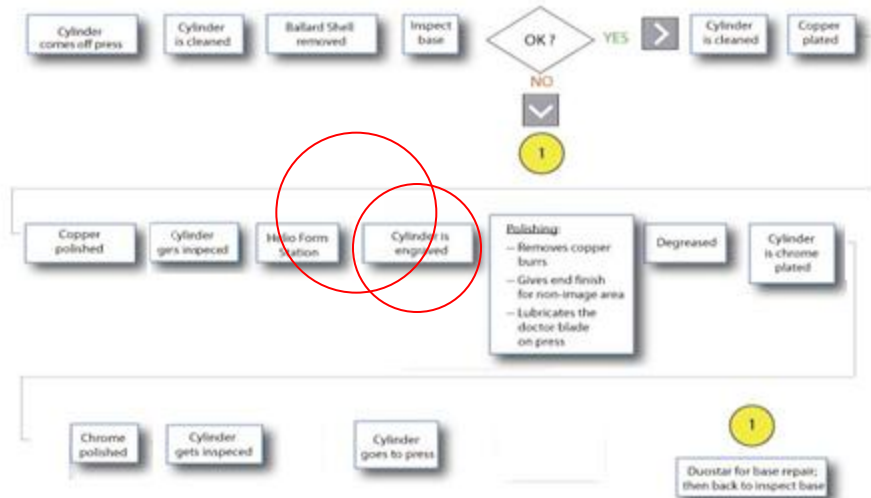
Helio Form Station

- Before engraving can begin, a press imposition form needs to be created.
- This form positions and aligns pages according to the book layout.
- Forms are digitally transferred to the engraving station.

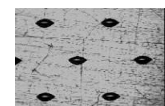
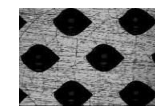
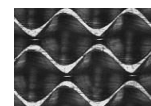
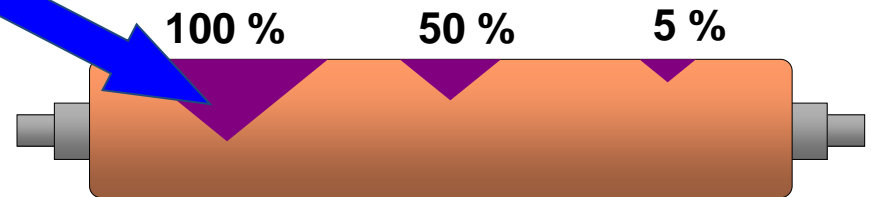


Cylinder Engraving

- After Helio form stage, the cylinder gets engraved.
- Digital data for text and images feeds these engraving heads, which images the copper cylinder.
- The printed image consists of honeycomb shaped cells or wells etched or engraved into a copper cylinder using a diamond-tipped engraving head.
- The un-etched areas of the cylinder represent the non-image or unprinted areas.

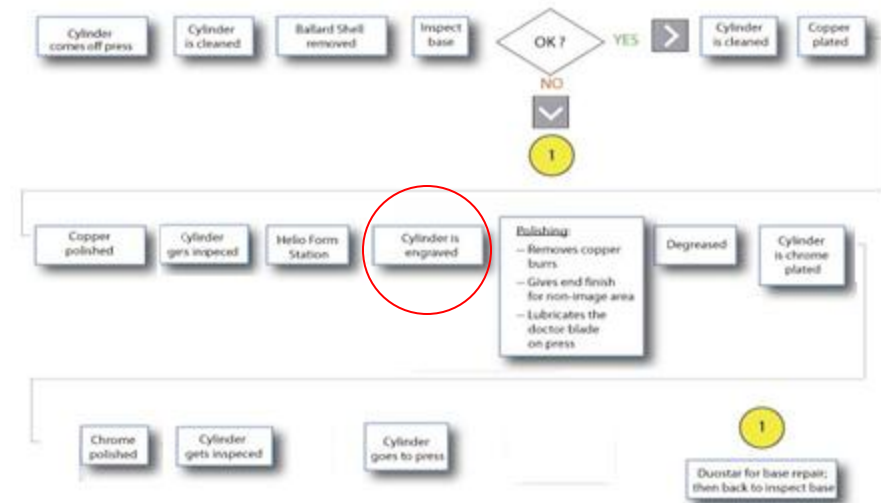


Cross Section of Cells Electromechanical Engraving



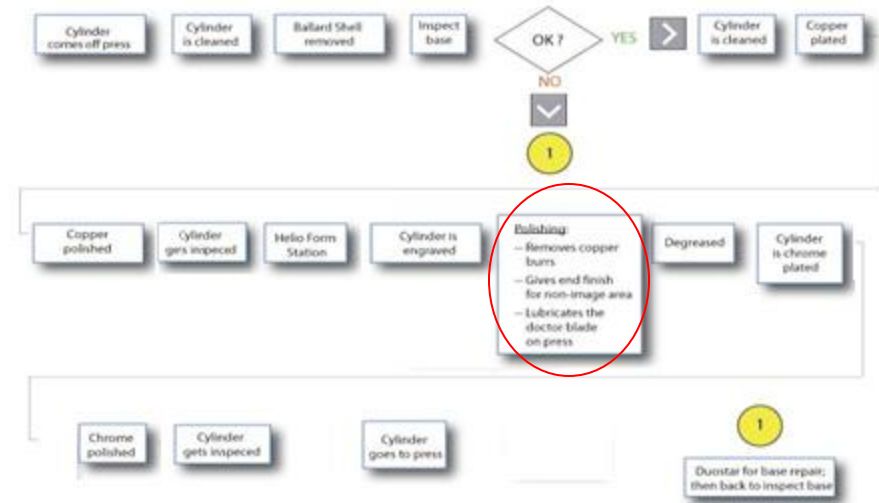
K6 Fully Automated Engraving Technology

- Engraving the image onto the cylinder is a high-speed, fully automated process.
- Diamond tips engrave hundreds of thousands of individual cells into the surface of the cylinder.
- The depth and size of the cells control the amount of ink that gets transferred to the paper.
- The size and shape of the cells also depend on the color of the ink and the type of paper that will be printed on.



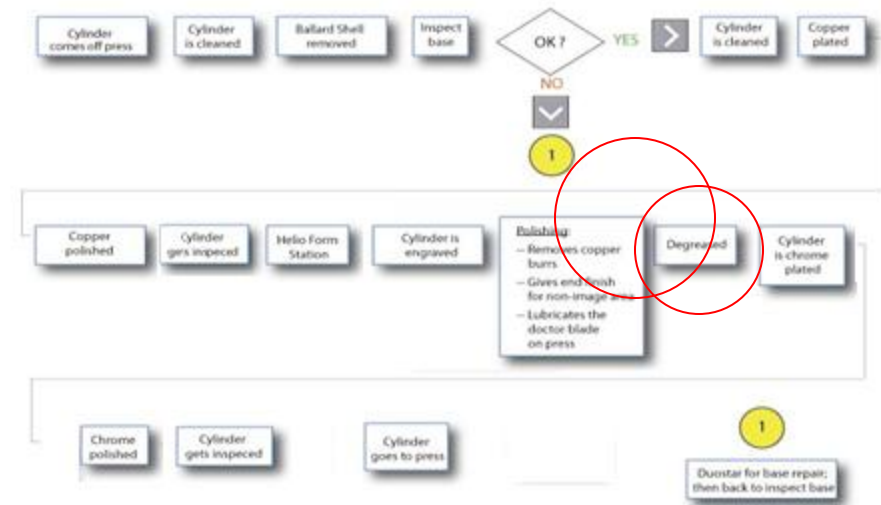
Pre-Chrome Polish

- After engraving, the cylinder is polished for a consistent surface.



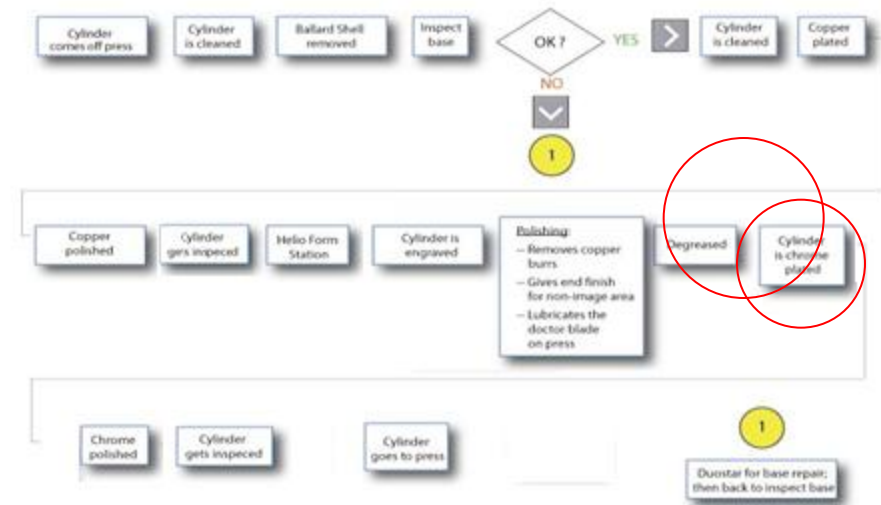
Cylinder is Degreased

- The cylinder is electronically cleaned to remove all grease and oil from the surface.



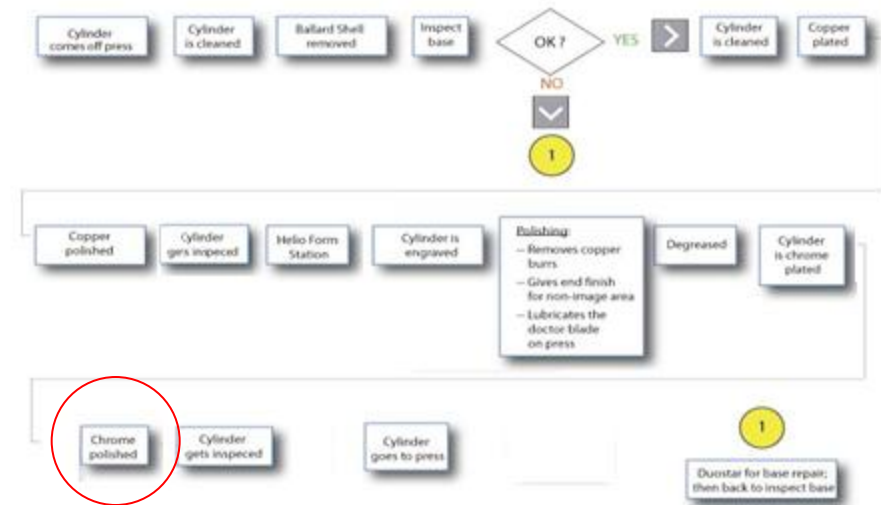
Chrome Plating

- Once the cylinder is engraved, it is cleaned and coated with a final layer of chromium.
- Chromium:
 - Provides a hard surface layer that will stand up to wear from the doctor blade during printing.
 - Allows cylinders to be used for press runs of over one million



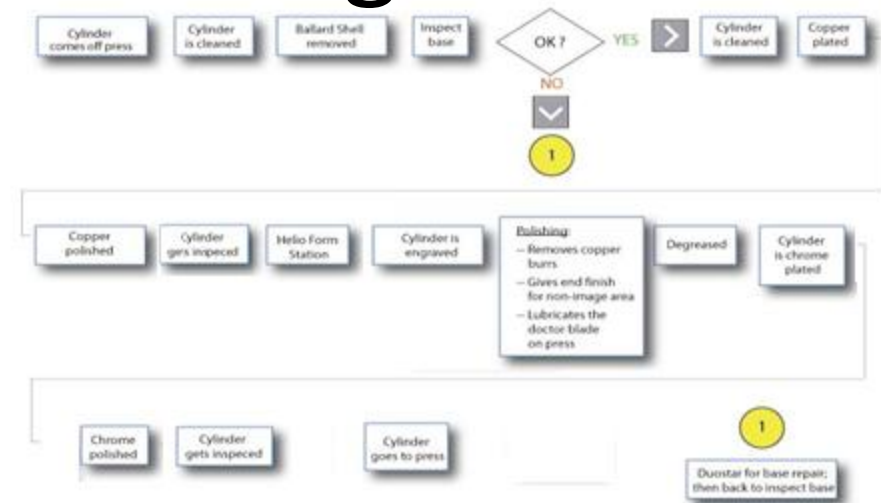
Chrome Polisher

- Chrome polisher looks like the pre-polisher.
- The chrome-plated cylinder is once again polished to “rough up” the surface so the ink acts as a lubricant.
- After the final chromium surface is polished, the cylinder is inspected and if it’s okay, it’s ready for the press.



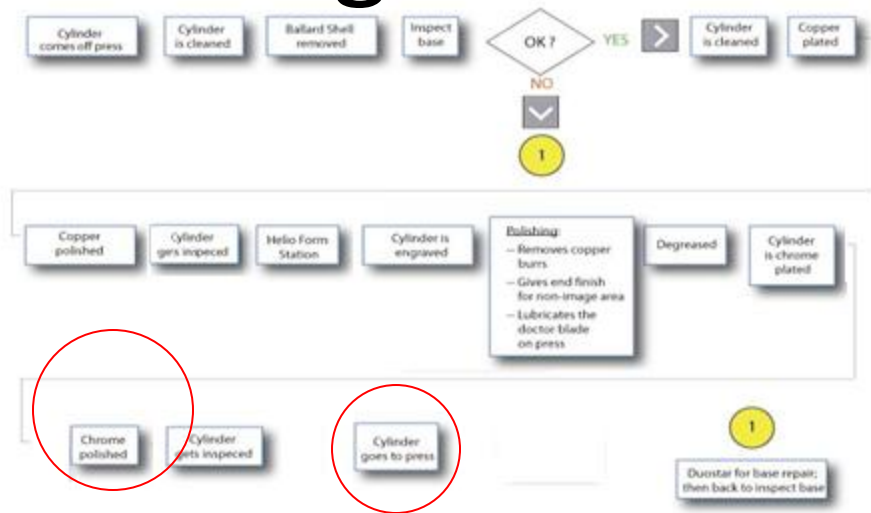
Cylinder Handling & Storage

- The cylinder is stored in racks to use for future jobs.



Cylinder Handling & Storage

- Cylinders are transported from imaging to the press room.
- During makeready, the press operator carefully loads the printing cylinders into the press.



Conclusion/Summary

- Technology change has been evolutionary.
- Current state has allowed for predictable, measureable cylinder manufacturing.
- We have been able to lock down critical points allowing for process control.
- Process Control= Stability, Predictability, and Flexibility which allows us to employ continuous improvement strategies.
- Global Economic Crisis has limited investment and risk taking.

